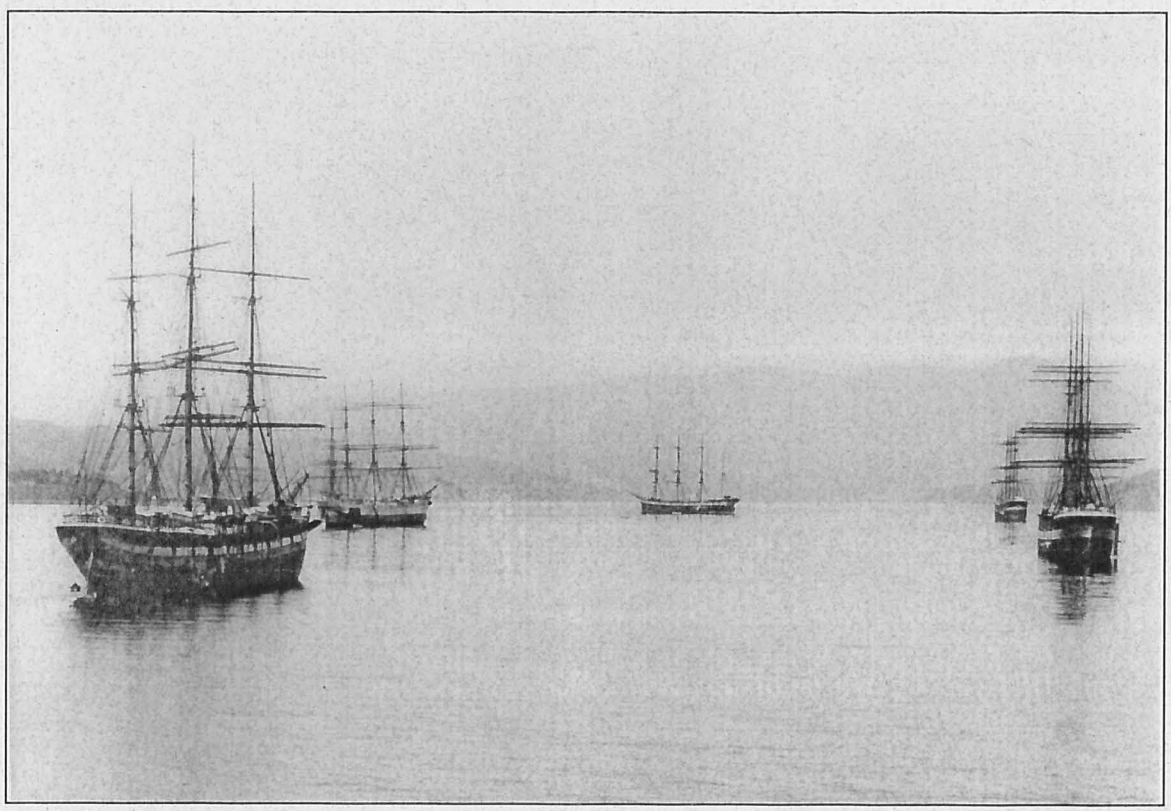
Carquinez Bridge Project
Addendum Archaeology Survey Report
Maritime Archaeology



CC-80, P.M. 12.1/14.14, SOL-80, P.M. 0.0/0.93
In the Counties of Contra Costa and Solano
EA 04193-004530

California Department of Transportation
District 04, Oakland

January 2001

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In the Counties of Contra Costa and Solano
EA 04193-004530

Prepared by:
James M. Allan, Senior Associate
William Self Associates
Orinda, CA

Under contract to:
Parsons Transportation Group
San Francisco, California

Submitted to:
Janet L. Pape, Senior Environmental Planner
Archaeology Manager, Toll Bridge Program
Caltrans District 4
111 Grand Avenue
Oakland, CA 94623

January 2001

Cover: Carquinez Strait, ca. 1875.
(Courtesy of the Contra Costa County Historical Society)

SUMMARY OF FINDINGS

In the months October 1999 through January 2000, archaeologists from William Self Associates (WSA) conducted remote sensing surveys and visual/tactile assessment operations as part of a maritime archaeological study for the Carquinez Bridge Project. Prior to commencement of field operations, WSA archaeologists conducted archival research in local libraries and repositories, and consulted with the National Archives in Washington, D.C. to develop the historic context of the study area.

Numerous acoustic targets were identified lying on or slightly below the bottom sediment in the remote sensing surveys. Most were determined to be either non-cultural in origin (i.e. exposures of the natural rock substrate) or culturally non-sensitive (i.e. anchor scars, buoy anchors, etc.). Fourteen acoustic targets of possible cultural origin were identified within the APE. No magnetic anomalies were observed in the APE.

Analysis of the acoustic data was sufficient to determine that 13 of the 14 targets within the APE were not maritime-related cultural resources. The targets appeared to be discrete deposits of either isolated debris, such as piles, or - if unidentifiable, were small enough to be eliminated as possible maritime resources. One of these was later reanalyzed and reassessed as possibly being a maritime resource. The configuration of the remaining target, designated as target Carq6, was sufficiently suggestive of a potential maritime resource that a visual/tactile assessment was required. Such an examination was made and the target was determined to be non-cultural in origin.

In November 1999 during excavations related to the installation of a load test pile, a cluster of four broken wood pile tips was recovered from beneath the bottom sediments. Analysis of historic photos and maps determined that the pile tips were likely associated with a wharf built in association with the construction of the 1927 bridge.

None of the identified targets, including the wood pile tips, proved to meet the criteria of eligibility for the National Register of Historic Places. No known or presently detectable prehistoric or historic archaeological sites are located within the boundaries of the study area.

Based on archival research, data collected during remote sensing surveys of the study area, and archaeological investigation of the unidentifiable target, it is the conclusion of William Self Associates that no further evaluation of cultural resources in the study area is necessary. Although the research for this study did not reveal any potentially eligible resources, such resources may be present within the study area, but buried beneath the bottom sediments. A qualified archaeologist, who can evaluate the nature and significance of the find, must evaluate discoveries of such resources, if any are made during construction.

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1.0 INTRODUCTION

In the months October 1999 through January 2000, archaeologists from William Self Associates (WSA) conducted maritime archaeological studies in the Area of Potential Effects (APE) for the Carquinez Bridge Project (Figures 1 and 2). Caltrans established the APE in consultation with the Federal Highway Administration (FHWA) on November 2, 1999 (Figure 3). The eastern boundary of the APE extends across the width of the Carquinez Strait and is formed by a line 1200 feet east of the existing eastbound Carquinez Bridge (SOL-80). Its western boundary is a line that extends across the width of the Carquinez Strait 1200 feet west of and parallel to the proposed new Carquinez Bridge.

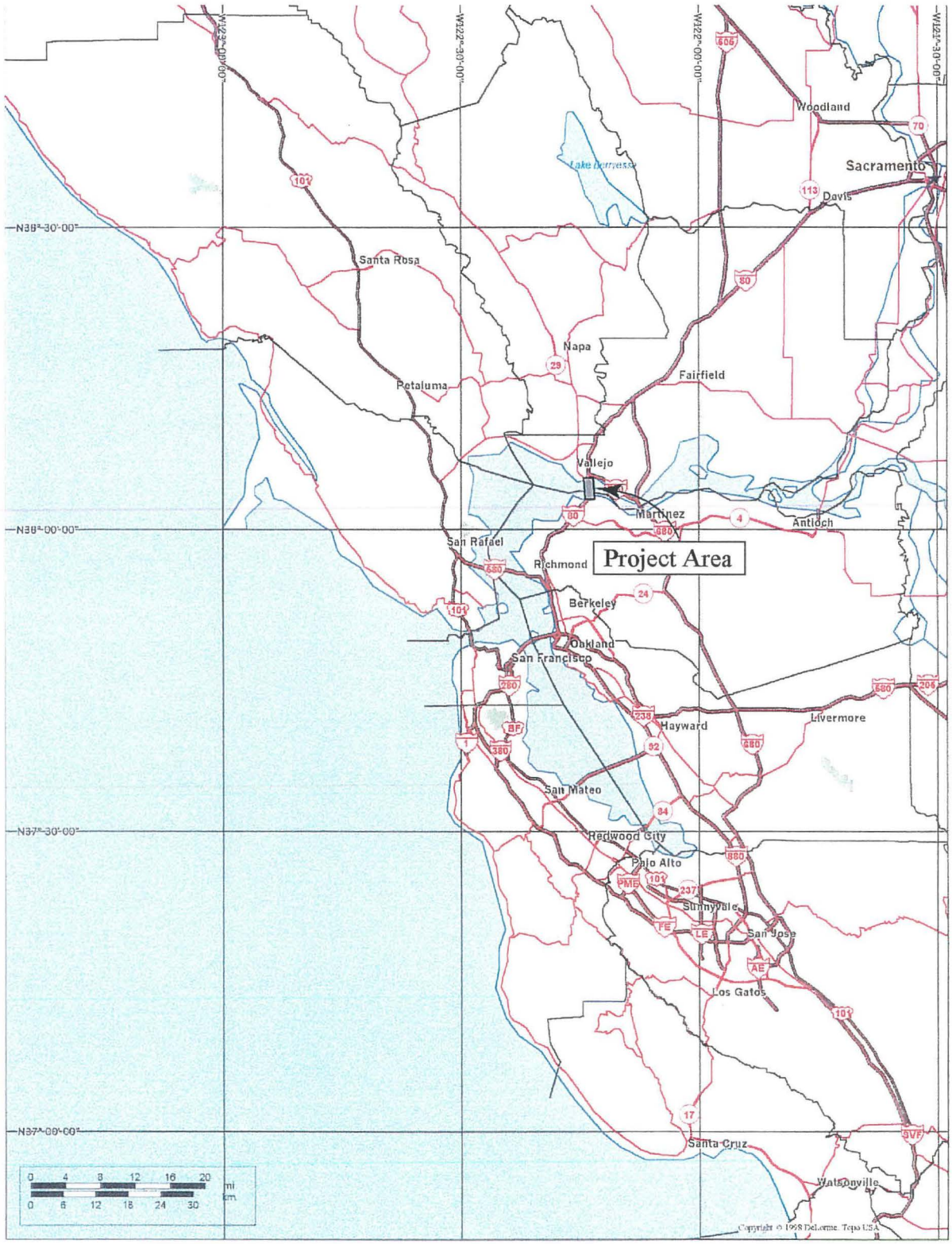
Following an extensive literature and records search, WSA conducted remote sensing surveys using side scan sonar and a magnetometer. Numerous acoustic targets were identified lying on or slightly below the bottom sediment in these surveys. Most were determined to be either non-cultural in origin (i.e. exposures of the natural rock substrate) or culturally non-sensitive (i.e. anchor scars, etc.). Fourteen acoustic targets of possible cultural origin were identified within the APE (Figure 4). No magnetic anomalies were observed in the APE.

WSA archaeologists analyzed the shape, surficial expression, size, acoustic shadow, and association of these targets and determined that of the 14 targets within the APE, 13 were not maritime-related cultural resources. One of these was later reanalyzed and reassessed as possibly being such a resource. WSA archaeologists conducted underwater investigations of the unidentifiable target, the results of which are discussed in Sections 5.0 and 6.0.

Following field investigations, Caltrans provided information regarding an anchoring technique used in the construction of the 1958 Carquinez Bridge. As discussed in sections 5.0 and 6.0 below, this information was used to formulate a possible interpretation of the side scan sonar target initially thought to be a non maritime-related cultural resource. Subsequent analysis determined that neither of the two targets appears eligible for listing in the National Register.

Professional staff

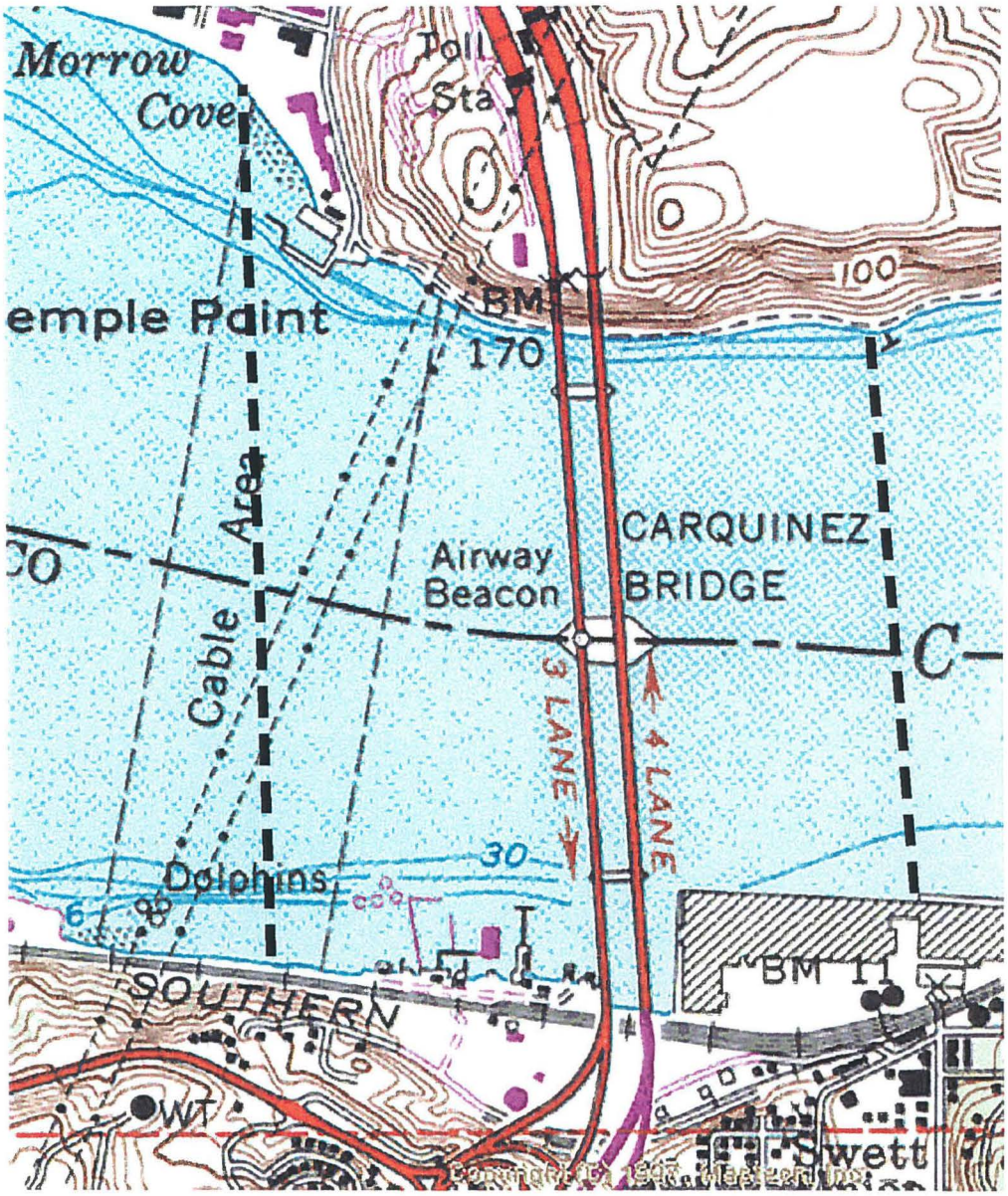
Archaeologists and staff of William Self Associates and Caltrans conducted field research and archival research. James M. Allan, Senior Associate of WSA, conducted archaeological and archival research for the project and is the principal author of this report. Mr. Allan is a Ph.D. (ABD) in Anthropology whose area of expertise is in maritime archaeology. Mr. Allan has over 13 years experience in the field and has over 11 years experience in California archaeology. Aaron Golbus, a WSA Associate Archaeologist, assisted in the remote sensing survey and ground-truthing operations. Mr. Golbus holds an M.A in Maritime Studies and has over five years experience in the field of maritime archaeology. Caltrans archaeological intern Adam Sriro



Project Vicinity Map

Figure 1

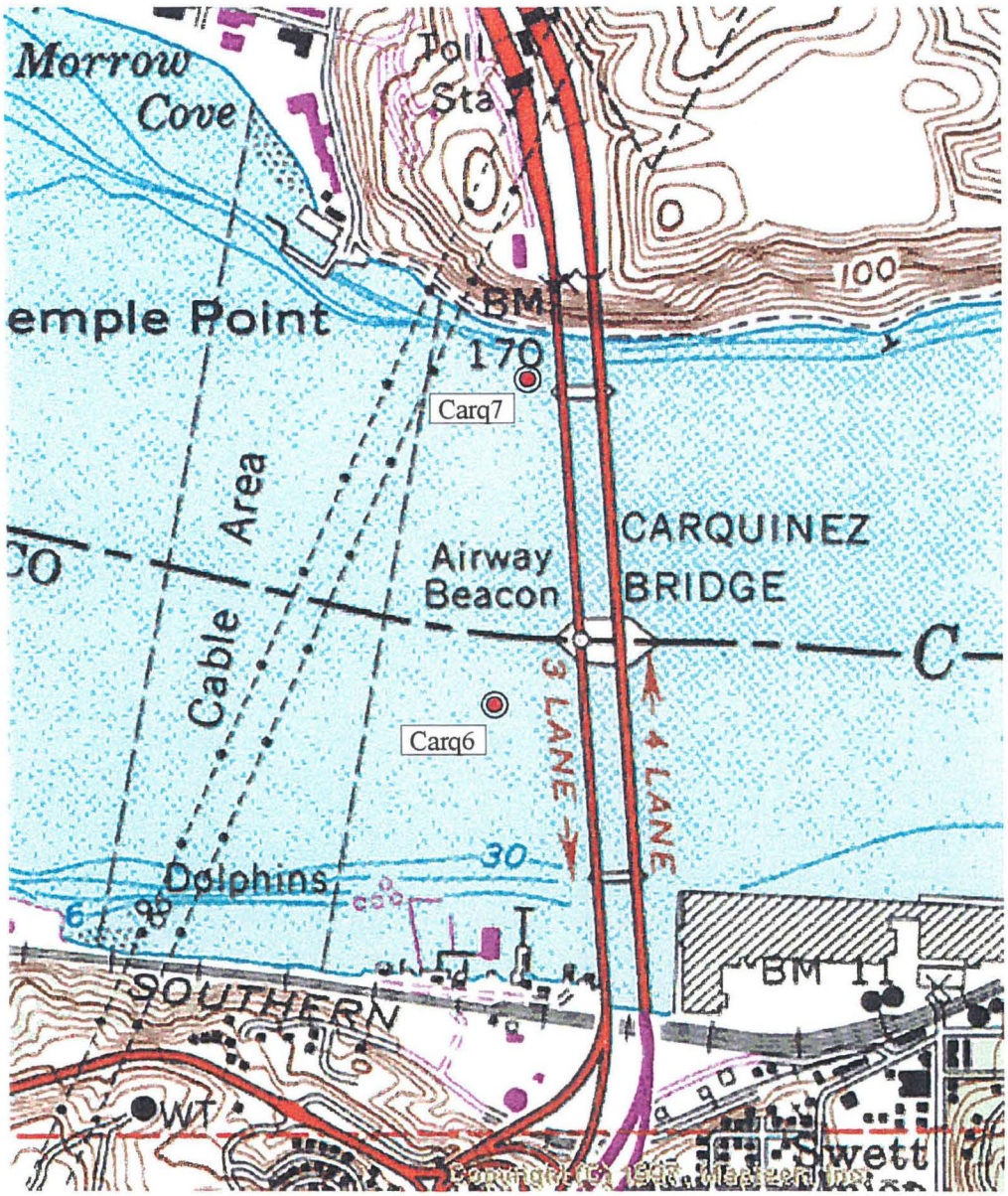
Carquinez Bridge Project
Maritime Archaeology Study



Project Location Map

Figure 2

Carquinez Bridge Project
Maritime Archaeology Study



◉ Carq-n = Location and number of acoustic targets

Location of Carq6 = 38 03.595N/122 13.577W
Location of Carq7 = 38 03.871N/122 13.533W

BENICIA, CALIF.
1959 (1980)

0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

BATHYMETRIC CONTOUR INTERVALS IN FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

N

Figure 4

Acoustic
Target Locations

Carquinez Bridge Project
Maritime Archaeology Study

assisted in the remote sensing and ground-truthing operations. Mr. Sriro holds a B.A. degree in Cultural Anthropology, and is a graduate student in Anthropology at Sonoma State University. Mr. Sriro has two years experience in Andean archaeology and five years experience in California archaeology. Caltrans archaeologist Jack Hunter served as the Caltrans on-board Representative during the side scan sonar and magnetometer field investigation. Mr. Hunter has over 20 years experience in maritime archaeology and holds a B.A. in Anthropology.

2.0 PROJECT LOCATION AND DESCRIPTION

The maritime archaeology survey for the Carquinez Bridge Project involved side scan sonar, magnetometer, and sub-bottom profile surveys within the project's APE. The remote sensing surveys were conducted to determine whether cultural resources - historic shipwrecks in particular - lie submerged within the APE. There were no magnetic anomalies identified in the survey. Acoustic targets that could not be identified solely based on data interpretation were investigated through tactile assessments in scuba dives conducted by WSA archaeologists. Diving investigations were conducted on October 15, 16, 18, 1999; November 15, 1999; December 21, 1999; and January 5, 2000.

3.0 SOURCES CONSULTED

Records and literature searches were conducted at repositories and local archives within the greater Bay Area. These included the California Historic Resources File System, Northwest Information Center, Sonoma State University; the National Archives, Pacific Sierra Region; the San Francisco History Center of the San Francisco Public Library; the J. Porter Shaw Maritime Library; the Oakland Public Library; the Bancroft Library and the Doe Library of the University of California; the shipwreck inventory of the California State Lands Commission; and the Automated Wreck and Obstruction Information System (AWOIS) of the National Oceanographic and Atmospheric Administration. In addition, Wreck Reports of the San Francisco Customs Office retained in the National Archives in Washington, D.C. were consulted through staff contact by phone and mail.

Additional sources consulted include the United States Department of Interior's National Register of Historic Places (1966-1991), California Register of Historic Resources (California State Office of Historic Preservation 1976), the California Historical Landmarks (California State Office of Historic Preservation 1982), the archives of the Contra Costa County Historical Society, and the research library of the Vallejo Naval and Historical Museum. Historic maps were consulted at the University of California at Berkeley's Historic Map Center, as were photographs in the collection of Caltrans District 4.

R Alastair Slocumb 11/2/99
FHWA Transportation Engineer Date

Area of Potential Effects

1200 ft

Area of Potential Effects

Proposed New Bridge

SOL-80 (West Bound)

SOL-80 (East Bound)

CROCKETT

VALLEJO

Area of Potential Effects

1200 ft

Area of Potential Effects

NEW CARQUINEZ BRIDGE PROJECT

MARITIME ARCHAEOLOGY
AREA OF POTENTIAL
EFFECTS MAP

Scale: 1:4000

USERID: bioseph@T4NTA212 FILE: a:\main-bridge\ape.dgn DATE: Wed Oct 6 1999

One terrestrial prehistoric archaeological site has been recorded within one-quarter mile of the APE (the Crockett Shellmound, CCO-253/H.) No maritime cultural resource surveys have been conducted, nor have any maritime archaeological sites been recorded within one-quarter mile of the APE. In the records and literature search, four shipwrecks or potential shipwrecks were identified as occurring within or near the boundaries of the APE, or may have drifted into the study area before sinking. These wrecks are discussed below.

4.0 BACKGROUND

4.1 Environment

The Carquinez Bridge Project lies within the geomorphic province of the Coastal Range, and is situated in a biotic zone known as the California Prairie. The Strait itself is a principal feature of the largest estuarine system in California. Comprising the San Francisco, San Pablo, and Suisun Bays, the Carquinez Strait, and a maze of peripheral channels and tidelands, the Bay system occupies a late Pliocene trough that extends southward to form the Santa Clara and San Benito valleys, and northward across San Pablo Bay into the Petaluma, Sonoma, and Napa valleys (Moratto 1984:219).

The Carquinez Strait is a winding trough, eight miles long and varying in width from one-half to one mile, cut through the sandstone, shale, serpentine, and chert that form a portion of the Coast Ranges. In places, it reaches depths of over 800 feet from bluff top to the bedrock bottom (Cohen 1996:4; Moratto 1984:15). The Strait is a major breach and water gap in the East Bay Hills of the Coast Range. The Sacramento and San Joaquin rivers combine to flow through the Strait, discharging into San Pablo Bay, San Francisco Bay, and eventually the Pacific Ocean (Caltrans 1998:3-51).

To the east of the Strait, the rising hot summer air of the Great Central Valley creates a daily low pressure system over the interior of California that pulls in the cooler air of the Bay system and the Pacific Ocean. The resulting afternoon winds blow steadily from the west and are funneled through the narrow breach of the Strait. On the ebb tide, these winds run counter to the current and create confused, choppy seas. However, the cooler winds passing through the Strait serve to reduce the ambient air temperature in the project area. Unlike areas to the north and south, which are significantly warmer, average daily summer temperatures in the project area range from the mid-70s (Fahrenheit) to the mid-50s. In the winter, the pattern of high and low pressure systems is often reversed, bringing fog from the Great Central Valley into the Strait and reducing temperatures from around 60 degrees Fahrenheit, to the low 40s and occasionally down to freezing (Cohen 1996:3). The project area receives 20-25 inches of rain per year, with most of it occurring in the months of December, January, and February.

The Carquinez Strait serves as a boundary between Contra Costa and Solano counties. The southern portion of the Strait lies in the northern portion of Contra Costa County, which contains approximately 20 percent of the urbanized land in the County. The cities of Martinez, Port Costa, and Crockett are situated along the southern shore, within or near the APE. The southwestern portion of Solano County lies in the northern portion of the Strait, which encompasses the cities of Vallejo and Benicia, two of the six urban areas in the County.

Existing land uses along both the north and south sides of the Strait include residential, industrial, and maritime-related activities. The historic C&H Sugar Company refinery is situated on the southern side of the Strait, just east of the Carquinez Bridges, near the Crockett cogeneration plant. To the west and south, the Wickland and Tosco oil refineries occupy large tracts of waterfront and inland property.

4.2 Ethnography

At the time of historic contact, the Costanoan or Ohlone Indians of the Penutian language stock occupied the project area. The terms Costanoan and Ohlone are used interchangeably in much of the ethnographic literature. Modern descendants of the Costanoan prefer to be known as Ohlone, a name derived from the *Oljón* tribe that occupied the San Gregorio watershed in San Mateo County (Bocek 1986:8). In the following discussion, the term "Costanoan" is used to describe the linguistic associations of the Ohlone and "Ohlone" is used to describe the people themselves and their lifeways.

Although the term Costanoan is derived from the Spanish word Costaños, or "coast people," its application as a means of identifying this population is based in linguistics. The Costanoans spoke a language now considered one of the major subdivisions of the Miwok-Costanoan, which belonged to the Utian family within the Penutian language stock (Shipley 1978:82-84). Costanoan actually designates a family of eight languages. Groups in the area from the Pacific Coast to the Diablo Range, and from San Francisco to Point Sur spoke these languages. Although linguistically linked as a "family," the eight Costanoan languages actually comprised a continuum in which neighboring groups could understand each other. Beyond neighborhood boundaries, however, a group's language would be unrecognizable (Levy 1978:485-486). On the basis of linguistic evidence, it has been suggested that the ancestors of the Ohlone arrived in the San Francisco Bay area about 500 A.D., having moved south and west from the Sacramento-San Joaquin Delta region (Levy 1978:486; Fredrickson 1973).

The eight Costanoan language groups were subdivided into smaller village complexes or tribes. The tribes were independent political entities, each occupying specific territories defined by physiographic features. Although each tribal entity had one or more permanent villages, their

territory contained numerous smaller campsites used as needed during a seasonal round of resource exploitation (Levy 1978: 487). The people who occupied the project area in 1770 belonged to a group called Karkin. The Karkin, who spoke a language of the same name, were a small group with a population of approximately 200 people (Levy 1978:485).

Ohlone families lived in domed structures thatched with grass, tule, wild alfalfa, ferns, or carrizo (Levy 1978:492). Semi-subterranean sweathouses were built into pits excavated in stream banks and covered with a structure supported by the bank. The Ohlone diet mainly consisted of vegetal foods gathered from seasonally available staples such as acorns, greens, roots, bulbs, and seeds. These resources were supplemented with protein-rich fish, waterfowl, and shellfish recovered from the waters, shore, and marshy shallows of the Strait and other areas of San Francisco Bay, as well as by deer and other inland fauna that were hunted for both their meat and hides (Holman 1992:8). Using seine and dip nets, harpoons, weirs, basketry traps, hooks, and fish poisons, the Ohlone fished the waters of the bay and the saltwater marshes, streams, and rivers that flowed into it.

The Ohlone were accomplished watermen, employing small, lightweight boats fabricated from tule reed. In these fragile craft, formed from cigar-shaped bundles of reeds, the Ohlone gained access to the offshore islands where they raided seabird rookeries, and hunted seals and sea lions. Propelled by double-bladed paddles, the tule rafts were used to navigate across the Strait and throughout San Francisco Bay (Kroeber 1970:468). The paddles were similar to those used in the California Channel Islands, although the watercraft there were of wood-plank construction, not rushes. Because they were a mobile people, the Ohlone built their boats to last only a season, and could leave them behind with little afterthought (Margolin 1978: 37-38, 54-56).

The arrival of the Spanish in the San Francisco Bay Area in 1775 led to the rapid demise of native populations. Diseases, declining birth rates, and the effects of the mission system served to eradicate the aboriginal life ways (which are currently experiencing a resurgence among Ohlone descendants). Brought into the missions, the surviving Ohlone along with former neighboring groups of Esselen, Yokuts, and Miwok were transformed from hunters and gatherers into agricultural laborers (Cambra, et al. 1996; Levy 1978; Garaventa 1983; Shoup and Milliken with Brown, 1994). With abandonment of the mission system and the Mexican takeover in the 1840s, numerous ranchos were established. Generally, the few Native Californians who remained were then forced, by necessity, to work on the ranchos. For a thorough discussion of the Ohlone, see Cambra, et al. (1996). For a more extensive review of Costanoan ethnography, see Kroeber (1970), Levy (1978), Milliken (1983), and Garaventa (1983).

4.3 History

Some controversy exists over the location of Francis Drake's visit to "Nova Albion" in 1579, which marked the beginning of the historic period in this region. The issues surrounding the controversy will not be addressed here and for purposes of this report, the historic period in the eastern San Francisco Bay region will be considered as beginning with the Fages-Crespi expedition of 1770. The Fages party explored the eastern shore of San Francisco Bay, eventually reaching the location of modern Fremont, where they traded with the local Costanoans. Members of the expedition first sighted the entrance to San Francisco Bay from the Oakland Hills. In 1772, a second Fages expedition traveled from Monterey through modern-day Milpitas, San Lorenzo, Oakland, and Berkeley, finally reaching Pinole on March 28, 1772 (Cook 1957:131). From there they traveled through the locations of today's Rodeo and Crockett to Martinez, made a brief foray into the delta region of the Central Valley, and then camped somewhere near Pittsburg or Antioch. On 31 March, the Fages party began the return journey to Monterey. They traveled to the vicinity of modern-day Walnut Creek, turned south, and then made their way to the vicinity of Danville, where they spent the night. On 1 April, they passed through today's San Ramon, Dublin, and Pleasanton, finally arriving back in the area of Milpitas on the following day.

In 1776, the Anza-Font expedition traveled through the same area and traded with residents of native villages encountered along the way. The significant impact of the European presence on the local California natives, however, was not felt until the Spanish missions were established in the region. The preceding year, Captain Juan Manuel Ayala, commanding the ship *San Carlos*, explored San Francisco Bay, venturing up the Sacramento and San Joaquin Rivers in search of a suitable mission site. Ayala's sailing master, José de Cañizares, used the ship's longboat to create the first map of San Francisco Bay, navigating from its southern terminus, to the mouth of the delta in the north (Galvin 1971:99).

The first mission in the region was established on October 9, 1776 with the completion of San Francisco de Asis (Mission Dolores) in San Francisco (Beck and Haase1974: 19). Mission Santa Clara de Asis followed in 1777, and Mission San Jose in 1797. The ensuing Mission era lasted for the next 46 years and proved to be the downfall of the native inhabitants of the region, who were brought to the missions as conscripts for labor under the pretense of "Christianization." The missions became the loci of native "missionization," which brought disease, subjugation, and ultimately decimation, to the native Californian groups. It is reported that by 1810, the traditional Costanoan lifestyle ceased to exist (Levy 1978:486). Diseases introduced by the early expeditions and missionaries, and the contagions associated with the forced communal life at the missions killed a large number of local peoples, exemplified by a mass burial of 18 individualsadjacent to the Hotchkiss Mound site near Oakley (Heizer 1954). Cook (1943)

estimates that by 1832, the Costanoan population had been reduced from a high of over 10,000 in 1770 to less than 2,000.

The discovery of gold in the Sierra Nevada in 1848 produced a major population increase in the northern half of California as immigrants poured into the territory seeking gold or the opportunities inherent in producing goods or services for miners. Prior to the gold rush, San Francisco - then known as Yerba Buena - was a sleepy hamlet situated on the shores of Yerba Buena Cove. The unpopulated, rolling, grass-covered hills surrounding the bays of San Francisco and San Pablo and the Carquinez Strait largely were used to graze the herds of cattle that provided the raw materials for the hide and tallow trade, at the time California's principal industry.

Following the U.S. takeover of Alta California from Mexico in 1846, the large land grants that had been distributed by the Mexican government were divided up and generally overrun by the Anglo immigration to the area. Most of the Mexican land grants in northern California were usurped by squatters who took quasi-legal title to lands, and by the U.S. courts that refused to confirm the titles to the original grantees, a situation that was exacerbated by the land boom following the Gold Rush of 1849.

Crockett

In 1866, J.B. Crockett acquired 1,800 acres of the Rancho Cañada del Hambre land grant as payment of a legal fee. Crockett persuaded a friend, Thomas Edwards, to join him in founding a town on the land. In 1881, the land was finally surveyed and the town was laid out and named for Crockett, who by then was a state Supreme Court justice (Tatam1993: 176).

John Heald purchased property from Edwards along the town's waterfront in 1888 and established a foundry, machine shop, and agricultural works. There he manufactured boilers, engines, threshers, crushers, barley mills, and a variety of other large agricultural and industrial equipment. Heald's substantial brick building eventually was sold to Dunham, Carrigan, and Company of San Francisco and later the warehouse was taken over by the grain merchants Eppinger and Company. Subsequently, it became known as the Banker's Warehouse and was purchased by the California and Hawaiian Sugar Refining Corporation (Purcell 1940:631).

Shortly after Heald established his business, Ambrose Starr also purchased property from Edwards on which he built the Starr Flour Mill (CHS nd: 7). Stores and small hotels began to spring up in the vicinities of the nascent enterprises. The new industries attracted workers who built homes, and the rich agricultural lands attracted farmers who settled in the area as well, all of whom added to the growth of the young town.

In 1893, the grain industry suffered a downturn and the Starr mill shut down. Four years later, George McNear established the California Beet Sugar Refining Company in the old Starr Flour mill. Hawaiian sugar cane growers soon bought into the enterprise with the intention of using the facility to refine cane, as well as beet sugar. The effort to refine beets was never very successful and McNear eventually sold his interest to the Hawaiians. By 1906, the enterprise had incorporated as the California and Hawaiian Sugar Refining Company, which operates the facilities to this day.

Perhaps the first wharf in the Crockett area was that built by Thomas Edwards in 1877. While facilities along the north shore at Benicia and Vallejo had been developed much earlier, such improvements on the south shore were sadly lacking. Shortly after Edwards built his wharf, other shipping concerns began developing the waterfront of the Strait's south shore. Such development created a need for warehousing and as Edwards was completing his wharf, the Danville, Alhambra, and Walnut Creek Granges began planning the construction of the Granger's Warehouse at Eckley, just a half-mile east of Crockett (Stachle 1945:194). Following this in 1879, the Port Costa Warehouse and Dock Company built a wharf that was subsequently acquired by George McNear, who operated it under his name for many years. The Balfour-Guthrie Company, an English concern, built the California Warehouse in 1882. It served as a major grain shipping dock until it burned in 1924 (Stachle 1945:195).

From these and several other warehouses erected along the south shore of the Strait, the grain and other agricultural produce of the county, as well as its industrial products, were shipped to various ports of the East Coast and the world. Stern-wheel steamers towing barges, scow schooners, sloops, and ships of nearly every description delivered cargoes to the various docks and wharves, and took on the exports of the county. Thomas Edwards, Jr., son of Crockett's founder, once recounted that as many as thirty-five or forty ships could be counted loading along the Straits at one time, with an equal number of ships waiting at anchor for space to open alongside the docks (Stachle 1945:197). In 1880, fully one-third of the ships clearing the Port of San Francisco had been loaded with wheat on the Carquinez Strait. By 1893, five hundred railroad cars a day arrived at the Strait, loaded with wheat that was to be transshipped to New York, London, Hamburg, the Mediterranean, and other ports around the world (Stachle 1945:197).

In 1914, a ferry service between South Vallejo and Vallejo Junction[3] was initiated by the railroad to accommodate passengers going to Napa and Vallejo. Passengers disembarked from the

[3] Although sharing the name of the city across the Strait, Vallejo Junction was located on the south shoreline, just east of modern-day Selby.

overland train, rode the ferry across the Strait, and reconnected with an overland train on the other side. In 1915 the Carquinez Ferry Company was formed. The enterprise purchased a facility known as Hanlon's Wharf and 10 acres of waterfront property at Valona, a small town adjacent to Crockett on the west, and then built a wharf at Morrow Cove on the northern side of the Strait. The ferry *Golden Gate* and one other vessel provided service for the line. The Rodeo-Vallejo Ferry Company subsequently purchased the Carquinez Ferry Company. It was this company that eventually won the franchise for the Carquinez Bridge; its property at Valona provided the bridgehead for the southern touchdown (Purcell 1940).

Vallejo

In 1852, at the urging of General Mariano Vallejo, the state legislature moved California's capital from San Jose to a tract of land on which Vallejo had promised to build a capital city, with a capital building, lodgings, schools, and churches. In accepting the grant and promise of development, the legislature named the new city "Vallejo" (Kyle 1990:471). The first meeting of the legislature in the new capital began in January, 1852 but it lasted only a week before the entire government, dissatisfied with the living conditions in Vallejo, moved the capital to Sacramento. Five months later, a devastating flood in Sacramento caused the legislature to adjourn, with plans to reconvene in Vallejo in January 1853. In February 1853, after meeting in Vallejo for a month, the capital was transferred to nearby Benicia. There it remained until February 1854, when it was permanently transferred to Sacramento (Kyle 1990:471; Wood, Alley 1879).

Despite this setback, the City of Vallejo grew steadily, principally because of the establishment in 1852 of the U.S. Navy Shipyard at the adjacent Mare Island. Fueling the city's growth was the early development of a reliable transportation system. As early as 1852, a small sloop made a monthly trip between Vallejo and San Francisco. Within three years, the steamer *Guadalupe* made three trips a week from Napa to San Francisco, with stops at Vallejo and Mare Island. In the late 1860s and early 1870s several companies provided ferry service to Vallejo. The ferry line running between South Vallejo and San Francisco used three ferries: the *Amelia*, the *Antelope*, and the *Yosemite.* In 1869, these were replaced with the faster steamer *New World* which made two round trips daily – each leg of which took only two hours. The ferry line, which also operated a freight-only ferry between Vallejo and San Francisco, was purchased in 1871 by the California Pacific Railroad (CPRR), which continued to operate the line until 1883. Two competitive lines, one operated by the California Steam Navigation Company, also served Vallejo from San Francisco during this period (Lucy nd: 92).

In 1883, the CPRR shut down the South Vallejo-San Francisco ferry service and inaugurated the South Vallejo-Vallejo Junction line that connected Vallejo with the south shore of the Carquinez

Strait. Travelers from Vallejo crossed the Strait in a ferry and connected with a train at Vallejo Junction that took them to Oakland where they could board another ferry to San Francisco. The Southern Pacific Railroad (SPRR) took over this service in 1885 and maintained the route until 1929.

One of the steamers operating on the Vallejo-Vallejo Junction route was the *Julia*. It was this vessel, discussed below, that exploded at the wharf in South Vallejo on February 27, 1889, killing thirty passengers, injuring twenty-six, and setting the wharf, ticket office, storage sheds, telegraph office, four passenger cars and six freight cars on fire (Lucy nd:93).

Piper, Aden, Goodall and Company provided competition to the SPRR ferry service with their operation of the ferry *Sunol,* which departed for San Francisco from the foot of Maine Street in Vallejo. The *Sunol* was considerably slower than the SPRR vessels, taking three hours and forty-five minutes to complete a one-way passage.

In 1895, the Hatch brothers started a steamer line to compete with both the SPRR and Piper, Aden, Goodall and Company. Their first steamer, the *Monticello,* could make the trip in two hours. Within three years, Piper, Aden, Goodall and Company had launched the *H.J. Corchoran,* a faster boat than the *Sunol* that could compete with the *Monticello.* In 1900, the Hatch brothers launched the *General Frisbie* and in 1904, they incorporated their line as the Monticello Steamship Company in order to purchase the fast steamer *Arrow*. This apparently was a telling blow, as Piper, Aden, Goodall and Company went out of the passenger service in 1905. The Monticello Steamship Company continued in competition with the SPRR, bringing on line the steamers *Napa Valley, Sehome, City of Sacramento*, and *Calistoga* (Hunt 1926; Lucy n.d: 93).

In 1918, while returning to Vallejo from San Francisco, the *General Frisbie* rammed the *Sehome.* The two vessels were locked together for a short time, allowing the *Sehome*'s passengers to transfer to the *General Frisbie.* Once the vessels disengaged, the *Sehome* sank (Hunt 1926; Lucy n.d: 94). The ultimate disposition of the sunken vessel has not been determined.

The Monticello Steamship Company continued operating until 1927, when it was purchased by the Golden Gate Ferry Company. Within ten years, ownership passed to the Southern Pacific-Golden Gate Ferry Company, which continued operating the line until 1937. Additional ferry services were provided by the Vallejo-Rodeo Ferry Company, founded in 1918 to provide transportation across the Strait for trucks and automobiles. The company remained in operation until 1927, when the Carquinez Bridge opened (Hunt 1926; Lucy n.d: 94).

The government provided service to Mare Island from Vallejo until 1867, when a Captain McGuire placed the steamer *Lizzie* into service. The *Mare Island* replaced *Lizzie* in 1870, and in 1879 the *Vallejo* was added to the line. *Ellen*, built in Vallejo, was added in 1883 and operated on the line until 1915. *Vallejo* provided service on the line until 1948. The ferry company remained in operation until 1986, when operations ceased over a docking dispute with the U.S. Navy (Lucy n.d: 94).

In 1927, dignitaries from four western states gathered in Crockett to christen the newly completed Carquinez Bridge. An engineering feat of the time, the great bridge provided the final link in the western overland highway system from Canada to Mexico, completing the Pan American Highway. This monumental architectural and engineering achievement eliminated the last water barrier, linking highways throughout the West and across the nation (Cohen 1996: 44). Its completion contributed to the demise of ferry services throughout the San Francisco Bay area. In 1958, construction was completed for a second bridge linking Crockett with Vallejo, aligned parallel to the first. It was built in response to the steadily increasing transportation demands resulting from California's growth, particularly in the Bay area. Despite the increased traffic flow provided by the bridges, congestion still prevailed. In 1976 ferry service between Vallejo and San Francisco resumed, after an absence of 49 years. Initially provided by the Red and White Fleet, the service was eventually taken over by the Blue and Gold fleet of San Francisco, which continues to operate the line today.

Potential Shipwreck Sites

It was against this rich background of maritime commerce and transportation in the Carquinez Strait that research was undertaken to identify the potential locations of submerged cultural resources. In view of the long history of industry, commerce, and transportation that has occurred in the narrow, confined waters of the Strait, it is surprising to find that only a small number of potential shipwreck sites have been identified in or near the APE. Many of the recorded incidents and accidents that occurred in the Carquinez Strait since the middle of the 19th century were relatively minor. Frequently, those that resulted in a sinking were resolved with the vessel being raised and salvaged or refitted, and put back into service. The vessels discussed below are those identified as potentially lying in or near the APE. They are presented in the chronological order of their possible demise.

Diana

According to one source, the steamship *Diana* exploded at the Vallejo Wharf on December 27, 1927 (Marshall 1978). This date may be wrong, as no reference to this seemingly newsworthy event could be found in the newspapers surrounding this date. A reference to an article in the

Daily Alta California of December 28, 1860 was found at the J. Porter Shaw Library, but the article itself could not be located.

Julia

In 1866 the steamer *Julia* withstood an onboard explosion that killed several passengers. Three years later, on February 27, 1889, the petroleum tank of the *Julia* exploded, killing at least thirty passengers. The explosion happened while the ship was at the South Vallejo Wharf.

> [the ship]. . . was broken in two, the crude petroleum used for fuel took fire, the vessel soon burned to the water's edge and the flames spread to the adjoining wharf, burning the offices and four cars" (*San Francisco Chronicle* 2/28/1888).

The same newspaper article recounts the facts and history of the ship, reporting that:

> *Julia* was built in this city [San Francisco] by Captain John North in 1864, and soon after being launched went into the river trade of the old California Steam Navigation Company. She was a side-wheeler, 170 feet in length, 32 feet beam and 8.8 in depth. Her gross tonnage was 503.20 and her net 407.31. Her engines were of 200-horse power and of the old class of steamship engines. The manager and owner is E.H. Miller Jr. of Alameda.

After the flames were extinguished, with the ship having burned to the waterline, the hulk may have been salvaged. Although the disaster received much news coverage, the focus was on the disaster and the dead, rather than on the fate of the wreck, so the ultimate disposition of the hulk could not be determined from these historical reports with any degree of certainty.

Uncle Abe

There is a report of the schooner *Uncle Abe* becoming stranded in the Carquinez Strait on June 6, 1877 (Marshall 1978). No other reference to the *Uncle Abe* could be found, and no mention of the ship could be found at the SF Maritime National Historic Park's J. Porter Shaw Library.

Sehome

Built in 1889, the *Sehome* started her life as a sternwheeler, named the *Mountain Queen.* The ship was converted to a sidewheeler, then later rebuilt as a twin screw. As mentioned, the *General Frisbie* rammed the *Sehome* in 1918. The two vessels were locked together long enough to allow the *Sehome*'s passengers to transfer to the *General Frisbie.* Once the vessels disengaged, the *Sehome* sank (Hunt 1926; Lucy n.d: 94). The ultimate disposition of the sunken vessel has not been determined.

5.0 FIELD METHODS

In the months October 1999 through January 2000, archaeologists from William Self Associates conducted maritime archaeological surveys in the Carquinez Bridge Project's Maritime Archaeology APE. A 600 kHz Marine Sonics Sea Scan sonar system and a Geometrics G881 Cesium magnetometer were used to collect the remote sensing data. The equipment was deployed from the 26-foot survey vessel *Betty Jo*, owned and operated by Sea Surveyor of Benicia, California. Sea Surveyor, Inc. also provided bathymetric information and incorporated positioning information from an Omnistar differentially corrected Global Positioning System into its on-board navigational computer to maintain horizontal control of the survey. In June 2000, Sea Surveyor conducted a sub-bottom profile survey in a discrete area of the APE in order to identify the exact location and orientation of a previously identified acoustic target that potentially lay within the footprint of one of the new bridge's proposed towers.

The maritime archaeology APE was surveyed in transects that were oriented in an east-west direction, parallel to the shoreline on the Strait. Transects were surveyed in intervals of 50 meters and the side scan sonar data were collected at a range of 50 meters per channel, providing a 100% overlap of each transect (Figures 5 and 6). Except for small portions of the APE along the northern and southern shorelines, the entire APE was surveyed. Due to the shallowness of the water directly beneath the existing bridges, the area beneath the southern touchdowns, from the shoreline to depths of approximately 4 feet was not surveyed, nor was the area underneath the pier supporting the C&H Sugar Refinery. In addition, due to its restricted confines, the area within the breakwater of the marina on the south shore, west of the existing bridges was not surveyed, nor was the area underneath the wharf of the California Maritime Academy on the north shore, west of the existing bridges. Although numerous acoustic and magnetic targets were identified within the APE lying on or slightly below the bottom sediments, most were determined during the survey to be either non-cultural in origin (i.e. exposures of the natural rock substrate) or of modern cultural origin (i.e. anchor scars, buried communication or power cables, construction debris, etc.).

Sea Surveyor's technical staff conducted preliminary analysis of the magnetometer data. During the post-survey data processing, WSA archaeologists analyzed the shape, surficial expression, size, acoustic shadow, and association of the targets acquired in the side scan sonar survey and determined that of the 14 targets of possible cultural origin within the APE, 13 were not maritime-related cultural resources. One of these was later reanalyzed and reassessed as possibly being such a resource. WSA archaeologists conducted underwater investigations of the unidentifiable target, which was designated as Carq6.

03-28

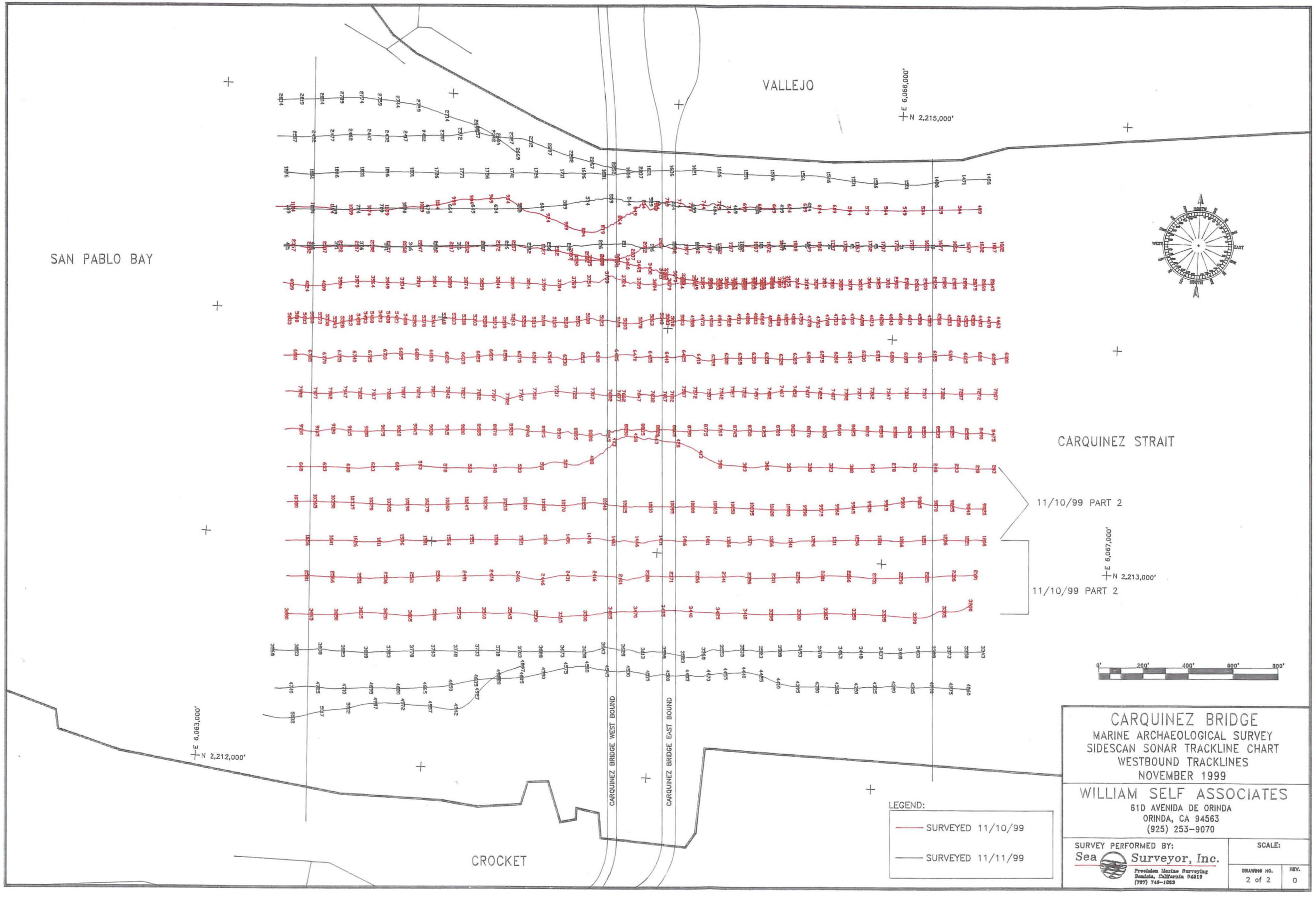


Figure 5
Survey Tracklines, Westbound

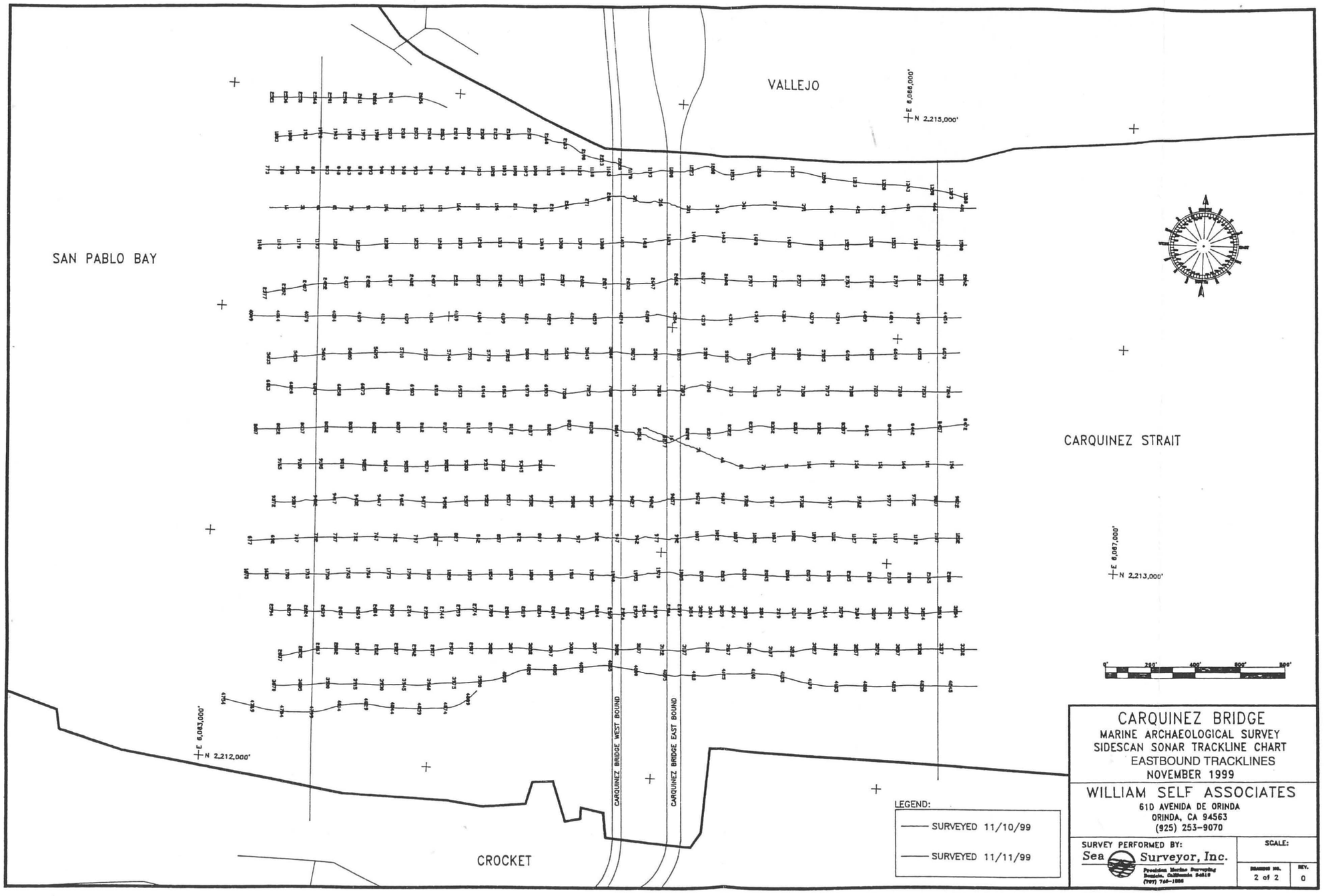


Figure 6
Survey Tracklines, Eastbound

Following the field investigations, Caltrans provided previously undiscovered information describing an anchoring technique used in the construction of the 1958 Carquinez Bridge. As discussed below, the information was used to reevaluate the interpretation of one of the acoustic targets identified in the remotes sensing survey. The target was subsequently designated as Carq7.

Investigations of target Carq6 were conducted on November 11, 1999 and on January 5, 2000. Operations began with sonar acquisition of the target's location. A buoy line, heavily weighted to overcome the drift effects introduced by the strong tidal currents, was dropped on the coordinates of the target. The sonar was then deployed to determine the relative locations of the buoy line anchor and the target. Based on that determination, a scuba-equipped WSA archaeologist was directed by two-way, surface-to-diver communications through the zero-visibility water conditions to the target location. In compliance with OSHA regulations, a tender on the diving platform controlled a tether to the diver, who was in constant communication with the diving platform. A standby diver was outfitted on the dive platform during all diving operations, as required. In conducting the visual/tactile investigation, WSA maritime archaeologists made four scuba dives on the target's location, the results of which are discussed in Section 6.0.

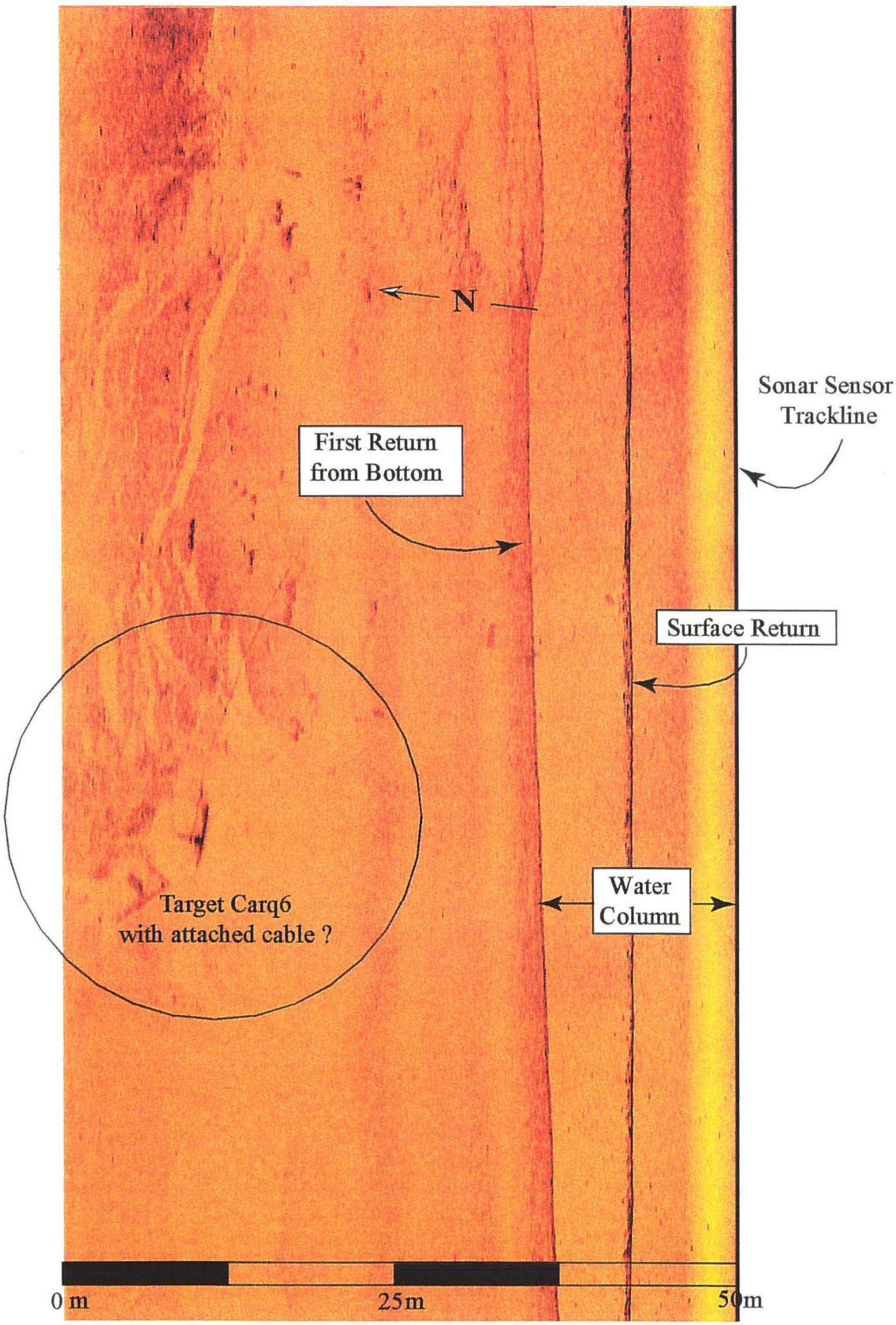
The possible identity of target Carq7 was determined through archival research. Specifically, an article in the September 1956 edition of *Western Construction* magazine provided by Caltrans describes a method used to anchor a caisson sunk to build a footing for the 1958 Carquinez Bridge. As discussed below, the materials and methods used in this anchor may be reflected in the acoustic image identified as target Carq7.

6.0 FINDINGS AND CONCLUSIONS

6.1 Findings

Target Assessment

Target Carq6: This target lies in approximately 100 feet of water and rests on the slope of the navigation channel, southwest of the center pier (pier 3) of the 1927 Carquinez Bridge. As depicted in Figures 7 and 8, the target comprises two linear components, each with apparent perpendicular projections. A long, thin line extends approximately 75 feet to the east from the eastern-most component. It may be a cable or anchor line, although no magnetic signature was observed in the magnetometer data collected during the survey.

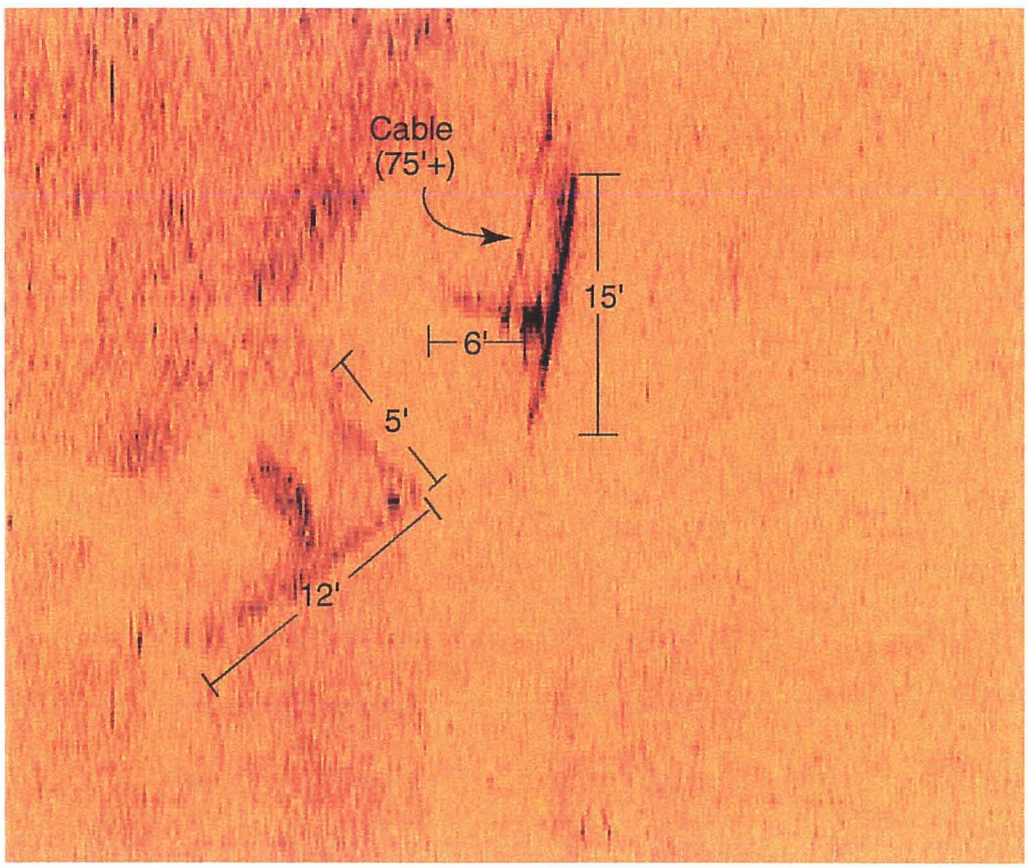


Target Carq6

(600 kHz View of Port Channel)

Figure 7

Carquinez Bridge Project
Maritime Archaeology Survey



(Image is cropped and enlarged from original sonar record)

Detail: Target Carq6 (600 kHz View of Port Channel)	Figure 8 Carquinez Bridge Project Maritime Archaeology Study

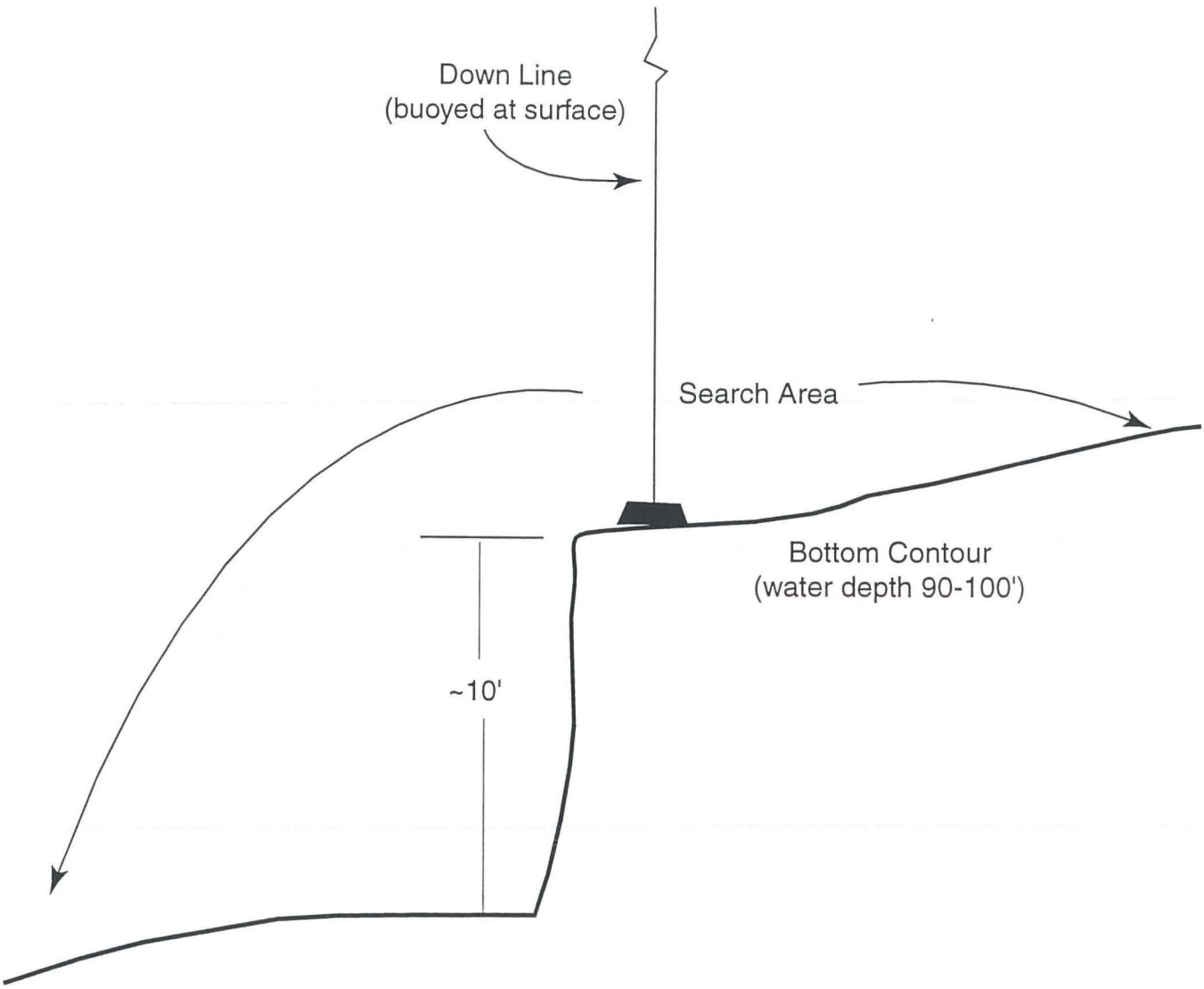
The visible portion of the eastern component is approximately 15 feet long, with a perpendicular projection that measures approximately 6 feet in length. The 75-foot-long cable or line appears to be attached to the perpendicular. The western component is aligned with the eastern portion at an angle of approximately 45 degrees. It measures approximately 12 feet in length and has two perpendicular projections, each measuring approximately 5 feet in length. A considerable amount of bottom scour has occurred around the target, and the two components appear to be lying in or next to a depression.

Four ground-truthing investigations were made at the target location. The black water, zero visibility diving conditions precluded anything other than a tactile search of the area. On each dive, circle sweeps of the target location were conducted over an area of approximately 3,800 square feet.

The bottom sediment is extremely hard, and appears to be very densely packed clay. The gradual slope of the bottom in the target area terminates in a very steep, nearly perpendicular drop that is at least 10 feet deep. The width of the cut could not be determined, as it exceeded the diameter of the search area (Figure 9). Loose gravel and quantities of small rock have collected at the base of the drop.

On each dive, the edge of the drop was traced for a distance of at least 15 feet. It appeared to be straight with a hard, firm edge. No evidence of the source of the long thin line, thought to be cable, could be found. No cultural material was encountered in any of the ground truthing dives conducted in the target area. However, the linear configuration of the sonar targets suggests they are not naturally occurring phenomena. The lack of a magnetic signature (which would have been observed in the presence of at least a metal cable) suggests that if the source of the acoustic target were cultural, it would be fabricated of non-ferrous material, most likely of wood. The absence of any such material in the search area, the linear configuration of the steep drop or cut in the bottom sediment, and the hard, sharp edge defining the top of the cut suggests the target observed in the sonar record may be the acoustic reflection of a cultural modification of the bottom contour. The sharp edge of the drop (or cut), its relatively straight alignment, and the hardness of the bottom sediment could conceivably create an acoustic signature like the one designated as target Carq6. If such is the case, given the target's proximity to the existing Carquinez Bridge, it may be an alteration of the bottom sediment associated with either construction or maintenance of the bridge, although it was not possible to ascertain this with degree of certainty.

Based on the tactile evaluations conducted during the assessment dives, and the absence of any cultural material in or around the target area, target Carq6 was determined to be neither culturally



Perceived Configuration of Bottom Contour: Carq6

Figure 9

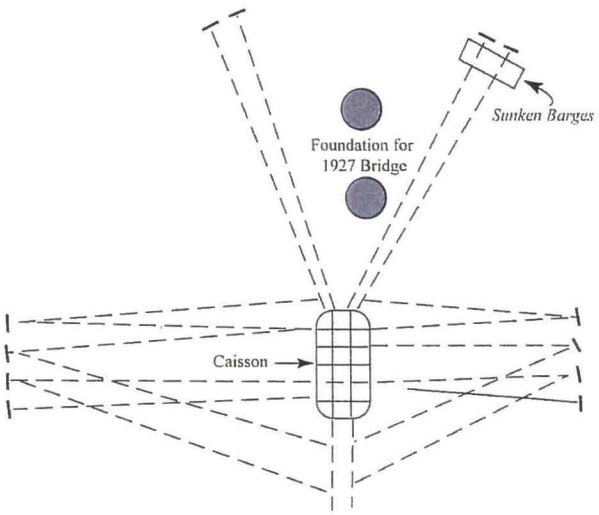
Carquinez Bridge Project
Maritime Archaeology Survey

nor temporally diagnostic. If it is, in fact, an alteration of the bottom sediment, it does not meetthe test of significance as measured against the National Register of Historic Places (NRHP) Criteria for Evaluation and can therefore be eliminated as a cultural resource requiring further consideration.

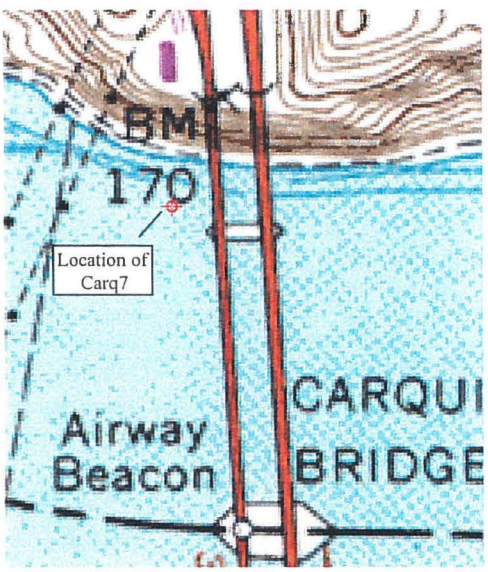
Carq7: Following the remote sensing surveys and field investigations, Caltrans provided an article from the September 1956 edition of *Western Construction* magazine that describes an approach used during construction of the 1958 Carquinez Bridge to anchor a caisson for the footing of the north tower. As described in the article

> In two locations, there was insufficient overburden on the bedrock to give the anchors [for the caisson] enough bearing. This problem was solved by sinking two derelict barges by filling them with rock and then filling the space between the barges and the anchors with tremie concrete (pgs 32-33).

Using this information, WSA reexamined the side scan sonar records to determine whether any evidence of the barges could be identified. In one sonar record, a target previously dismissed as being non-maritime related was reevaluated as possibly being associated with this construction technique. As depicted in Figures 10 and 11, three separate componen ts appear to comprise this acoustic target. The easternmost target appears to be rectangular with an exposed surface approximately 15 feet long and 4 feet wide. A portion of the exposed surface may project above the bottom surface as much as 5 feet. West of it, a round-to-oblong mass approximately 8 feet in diameter may project above the bottom sediments by approximately 10 feet. West of the round mass, a portion of another possibly rectangular object appears to lie partially buried in the bottom sediments. Its exposed surface is approximately 5 feet wide and 13 feet long, and a portion of it may project above the bottom sediment 6 to 8 feet. The location and configuration of these acoustic anomalies suggest they may be the remains of the



Plan View of Caisson Anchors (1958)



Target Carq7 on Mare Island Topo

two rock-filled, barges intentionally sunk during construction of the 1958 Carquinez Bridge to secure two of the casisson's anchors. The two rectangular objects described above may be remnants of the barges, and the intervening round mass may be the concrete that was pumped into the space between them and the anchors. However, it should be noted that the rectangular shapes are considerably smaller than those typically associated with a barge, although this may be a product of either the deterioration of the barges themselves, or the fact that they may be largely covered with bottom sediments. If the rectangular objects are the barges, they are likely fabricated of wood, since they did not generate a magnetic signature observable in the remote sensing survey.

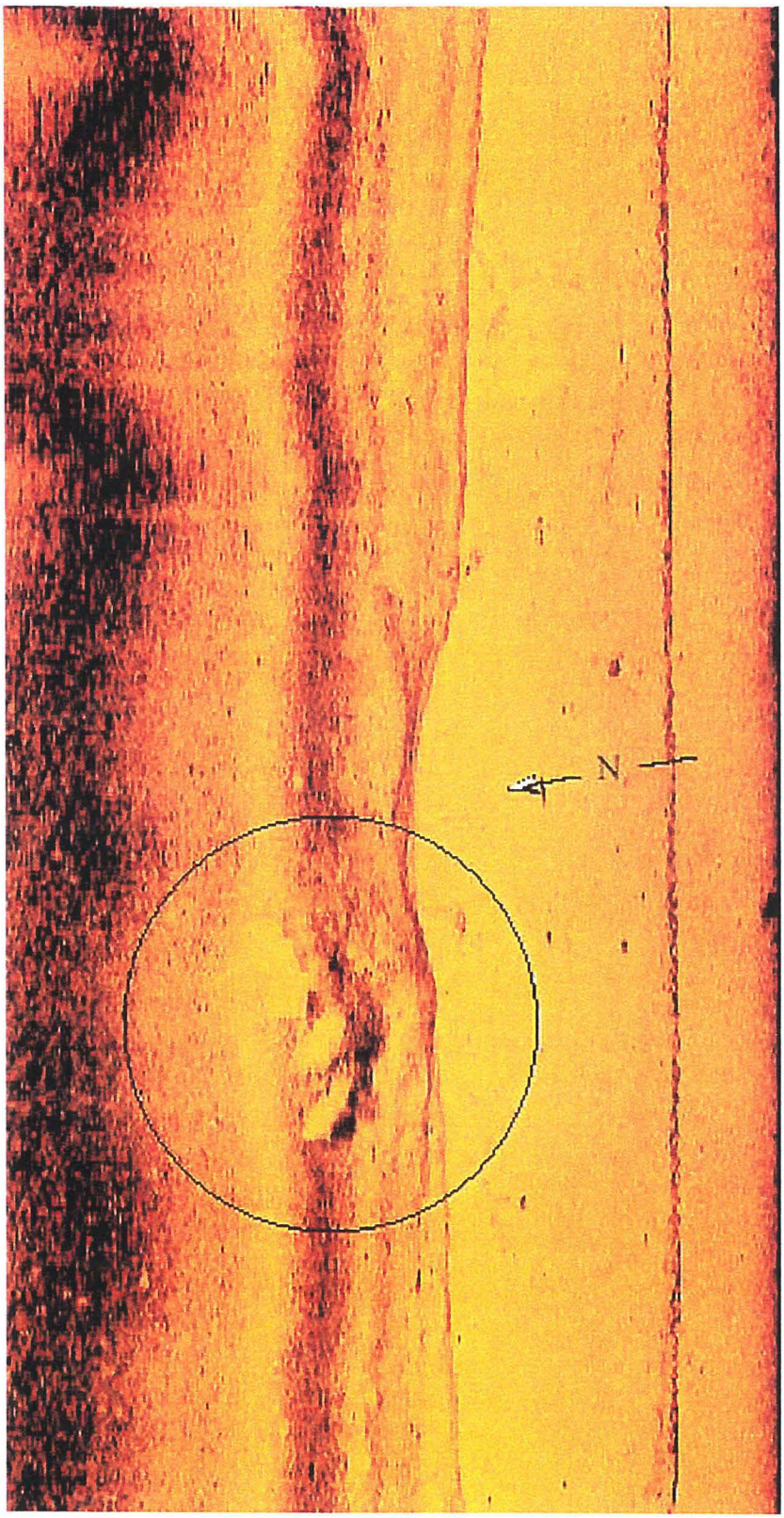
Because of the proximity of target Carq7 to the projected location of the new Carquinez Bridge's tower number T-3, Sea Surveyor, Inc. was retained by Caltrans to conduct a sub-bottom profile survey of a discrete area surrounding the location of the target. The purpose of the survey was to identify the horizontal extent of the target, a portion of which appears to be buried beneath the bottom sediments. Delineation of the target's extent would determine whether the material constituting the remains of the target would impact the construction of the new bridge footing.

On June 7, 2000 Sea Surveyor Inc. conducted a sub-bottom profile survey of a 100 square-meter block west of the 1927 Carquinez Bridge's northern tower. Twelve survey transects were conducted perpendicular to the bridge at 10 meter intervals; and five transects were surveyed parallel to the bridge (Figure 12). The location of the two objects thought to be the barges and intervening concrete deposit were identified in the survey (Figure 13). Using the coordinates for these targets, the location of the proposed tower footing was superimposed over a plot of the target locations. It appears from these calculations that the material comprising target Carq7 is situated outside the area in which the tower footing will be built, and the target will not be impacted during the tower's construction.

6.2 Conclusions

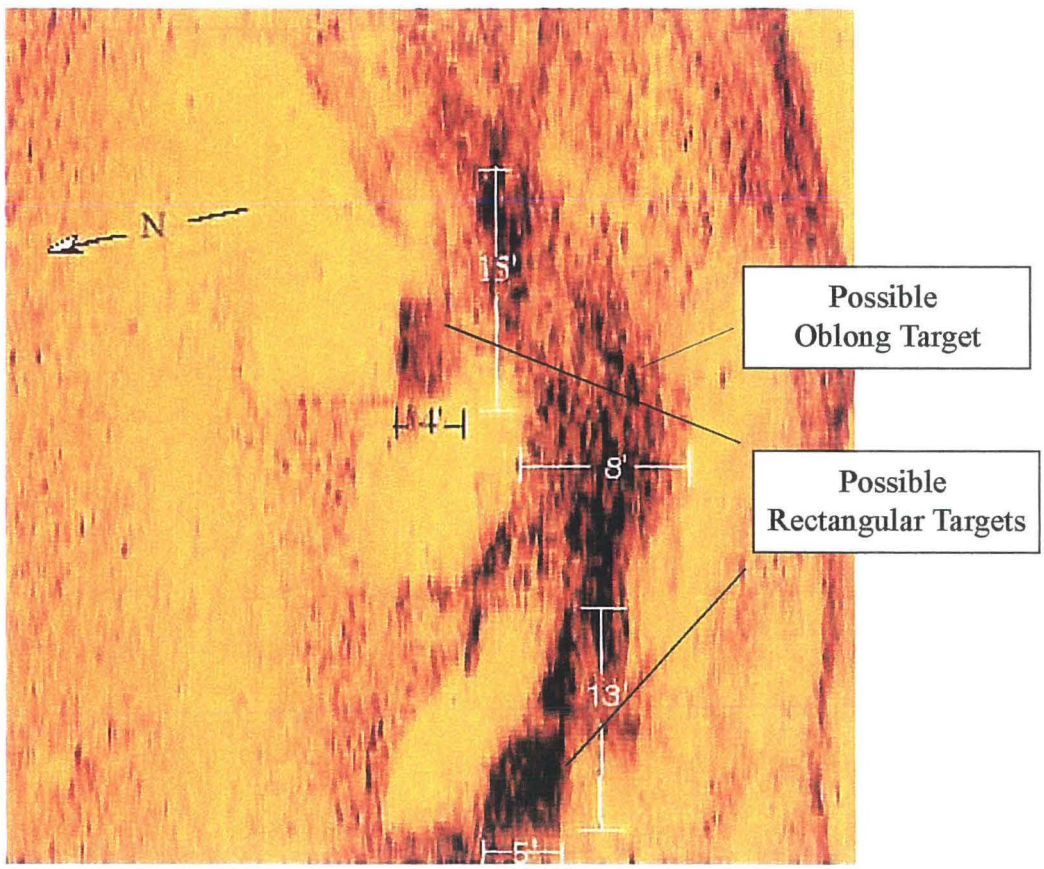
The isolated acoustic targets identified during the Carquinez Bridge Maritime Archaeology Survey have been evaluated in accordance with the criteria of eligibility for the National Register as defined in 36 CFR 60.4. Neither target Carq6 nor Carq7 meets the test of eligibility as measured against the NRHP criteria and neither merits further consideration as a resource with the potential to yield information about the past.

As discussed above, target Carq6 appears to be the acoustic reflection of a cultural modification of the bottom sediments. The sharp, straight edge defined by the reflection, the hardness of the



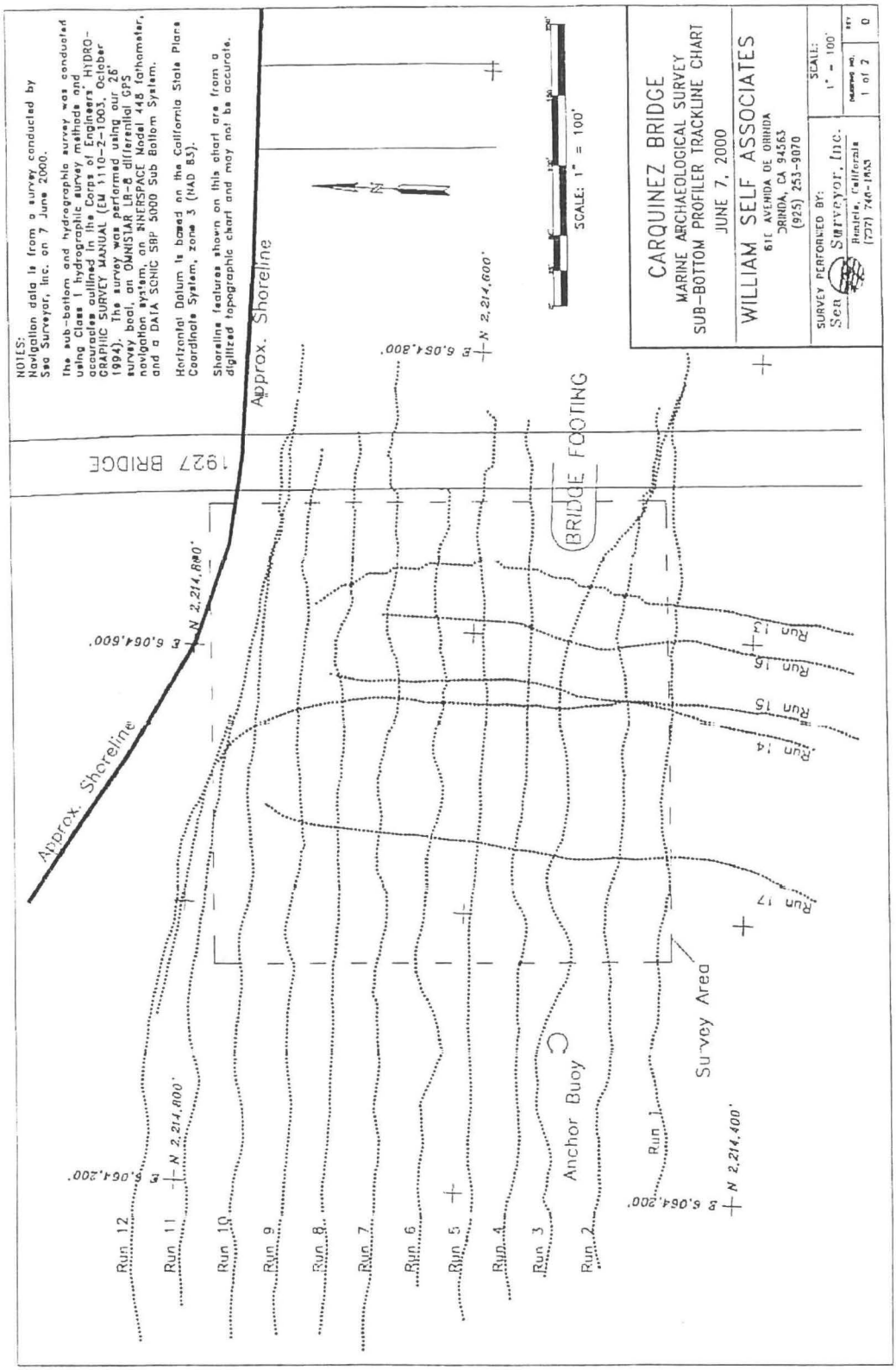
Target Carq7
(600 kHz View of Port Channel)

Figure 10
Carquinez Bridge Project
Maritime Archaeology Survey



(Image is cropped and enlarged from original sonar record)

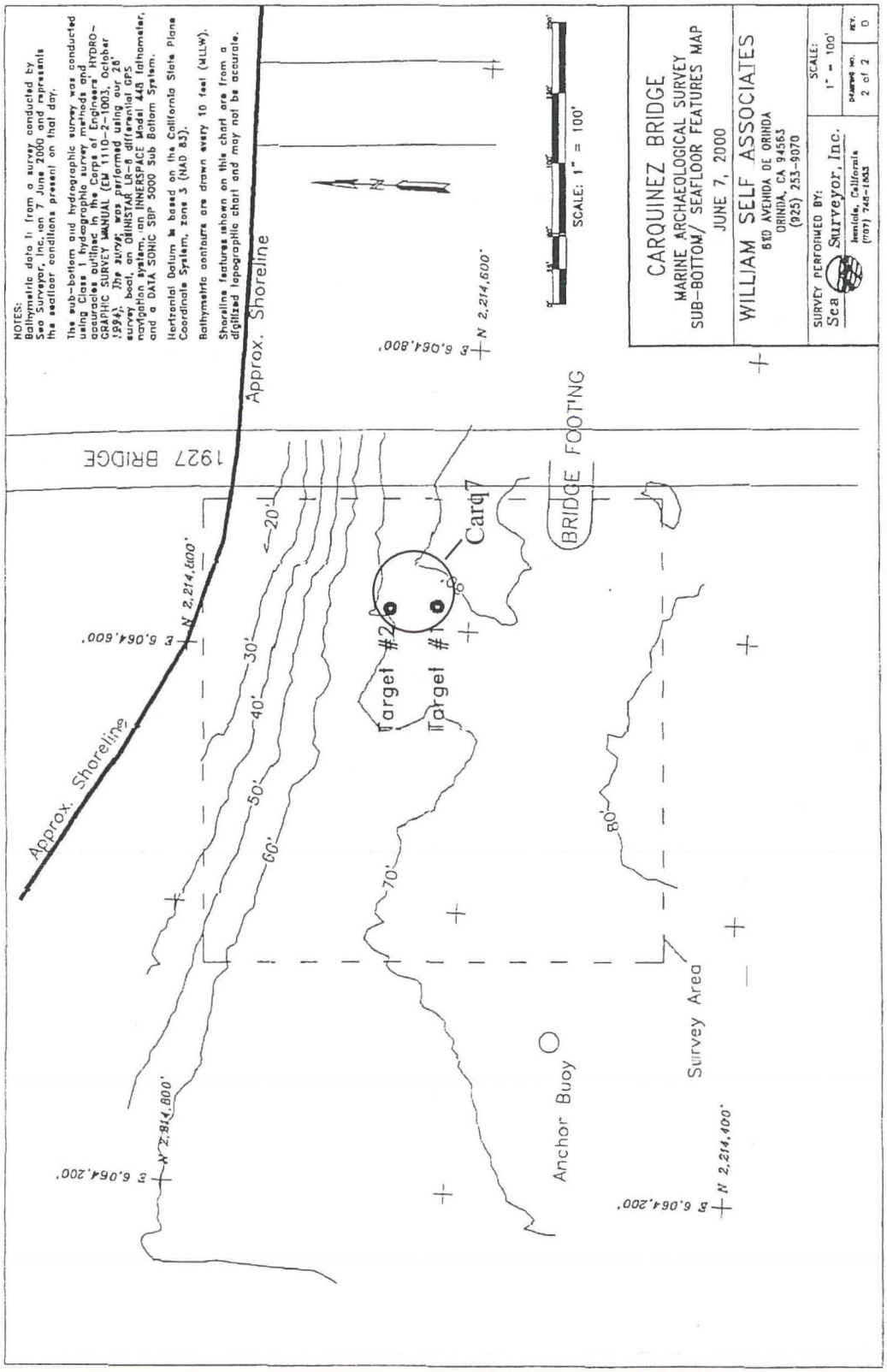
Detail: Target Carq7 (600 kHz View of Port Channel)	Figure 11 Carquinez Bridge Maritime Archaeology Survey



Sub-bottom Profile Survey Transects

Figure 12

Carquinez Bridge Project
Maritime Archaeology Study



Sub-bottom Profile Target Locations

Figure 13

Carquinez Bridge Project
Maritime Archaeology Study

bottom sediments, and the absence of any cultural material in the search area surrounding the target's location suggest the target may be a reflection of an alteration of the bottom sediment associated with either construction or maintenance of the bridge. Although it was not possible to ascertain this with any degree of certainty, the absence of any material remains in the target area essentially eliminates the possibility that Carq6 could be an eligible cultural resource.

Target Carq7 could possibly be a reflection of cultural material embedded in the bottom sediments, although careful analysis of the single acoustic image of the target acquired in the remote sensing survey, and extensive post-survey archival research has proven to be inconclusive. With the assumption that the two seemingly rectangular components of the acoustic target are remnants of the barges sunk in 1956, WSA and Caltrans archaeologists attempted to identity them so that an application of the criteria of eligibility could be made. The construction company responsible for sinking the barges during construction of the 1958 Carquinez Bridge was contacted but could not provide any information about the barges. Maritime records in the collections of the J. Porter Shaw Maritime Library were consulted, but no information about the derelict barges could be found. Careful examination of the acoustic image suggests that, if the two rectangular components of the target are portions of the barges, they vessels are apparently buried under substantial deposits of rock, concrete, and bottom sediments, and both may be broken into at least two pieces. If the acoustic image is that of the two barges, it would appear that they therefore lack integrity of design, setting, feeling and association.

An argument could be made that, if the targets are the barges, they retain integrity of location, design setting, materials, workmanship, feeling, and association insofar as they are the residual components of a method of construction. As discussed in the *Western Construction* magazine article, the barges were used to address a caisson-anchoring problem that was peculiar to the construction of the 1958 bridge. However, as an historic property, it is highly unlikely that the remnants of the sunken barges would actually meet criterion (c), the only pertinent criterion, as they do not embody the distinctive characteristics of a method of construction. Rather, the barges are more appropriately viewed as the fragmentary remains of a larger anchoring array, and as a component of an isolated construction improvisation employed to quickly address an unanticipated engineering setback. As such, they would fail to meet the threshold of eligibility as measured against the NRHP Criteria for Evaluation and therefore, target Carq7 can be eliminated as a cultural resource requiring further consideration. In any event, as determined by analysis of the remote sensing data, the material comprising target Carq7 is situated outside the area that will be impacted by the construction of the new north tower, and the issue of the target's integrity and eligibility is one that perhaps can be addressed when further information about its nature is uncovered.

Although all targets within the APE with the potential for significance were investigated and assessed, the possibility remains that other unidentified resources may be present below the bottom sediments. It is Caltrans policy to avoid cultural resources whenever possible. If the site(s) cannot be avoided, then additional assessment or mitigation may be warranted. If buried cultural materials are encountered during construction, it is Caltrans policy that work in that area must be halted until a qualified archaeologist can evaluate the nature and significance of the finds (Environmental Handbook, Vol. 2, Chapter 1.)

7.0 BIBLIOGRAPHY

Allan, James M.

1999 *Carquinez Replacement Bridge Project: Report of Potential Construction Impediments Observed in the Maritime Archaeology Remote Sensing Survey and Ground Truthing Operations.* William Self Associates for California Department of Transportation, December 1999.

Beck, Warren A. and Ynez D. Haase

1974 *Historical Atlas of California.* University of Oklahoma Press, Norman, Oklahoma.

Bocek, Barbara Rose

1986 *Hunter-Gatherer Ecology and Settlement Mobility Along San Francisquito Creek.* Ph.D. Dissertation, Stanford University, Stanford, CA.

Cambra, R., A. Leventhal, L. Jones. L. Field, and N. Sanchez.

1996 Archaeological Investigations at *Kaphan Umux* (Three Wolves) Site, CA-SCL-732: A Middle Period Prehistoric Cemetery on Coyote Creek in Southern San Jose, Santa Clara County, California. Report on file at Caltrans District 4, Oakland, CA.

CHS (Crockett Historical Society)

nd *A Short History of Crockett.* Crockett: Crockett Historical Society

Cohen, Andrew Neal

1996 *Gateway to the Inland Coast: The Story of the Carquinez Strait.* Crockett: Carquinez Strait Preservation Trust.

Cook, Sherburne F.

1943 The Conflict Between the California Mission Indians and White Civilization. *Ibero-Americana*, Vol. 22. Berkeley.

1957 The Aboriginal Populations of Alameda and Contra Costa Counties, California, *Anthropological Records of the University of California Anthropological Survey,* Berkeley, CA.

Daily Alta California (San Francisco)

1, 10 January1853; 28 December 1860; 25 October 1863; 20 September, 6 October, 26 December, 1864; 4, 5 February 1870.

Damon, Lowell, F.

1980 *An Archaeological Survey of a Portion of a Proposed P.G.&E. Transmission Line Located on the North and South Shores of Carquinez Strait Near the Carquinez Bridge, Solano and Contra Costa Counties, California.* Report on file at NWIC, Sonoma State University (S-2145).

Delgado, James P.

1986 *National Maritime Initiative Shipwreck/Hulk Database.* National Maritime Initiative, National Park Service, Washington D.C.

Department of Transportation

1955 - 1957 *Merchant Vessels of the United States*. Washington: US Government.

Ecumene Associates

1977 *Draft Environmental Impact Report. Benicia Waterfront Special Area Plan.* Prepared for the City of Benicia and the San Francisco Bay Conservation and Development Commission. Report on file at NWIC, Sonoma State University (S-5149).

Eisenman, Lynn and Christian Gerike, Jennie Lynn Goodrich

1979 *A Preliminary Cultural Resources Study of the Lakeville-Sobrante 230Kv T/L Project Area.* Prepared at the request of the Pacific Gas and Electric Company, San Francisco, California. Report on file at NWIC, Sonoma State University (S-1834).

California Department of Transportation

1998 *Carquinez Bridge Project. Final Environmental Impact Statement.* Sacramento: California Department of Transportation, District 4.

Fredrickson, David

1973 Early Cultures of the North Coast Ranges, California. Ph.D. Dissertation University of California, Davis.

Galvin, John, ed.

1971 *The First Spanish Entry into San Francisco Bay, 1775. The original narrative, hitherto unpublished, by Fr. Vicente Maria and further details by participants in the first exploration of the Bay's waters.* San Francisco: John Howell Books.

Garaventa, Donna

1983 *Cultural Resources Survey Report: San Francisquito Creek Bridge Replacement Project. Located on Junipero Serra Boulevard, Santa Clara County - San Mateo, California.* Hayward, California: Basin Research Associates.

Garaventa, Donna M. and Stuart A. Guedon, Michael D. Meyer, Darren J. Moore, and Conrad F. Praetzel

1993 *Archaeological Survey Report. Carquinez Bridge Project, Contra Costa and Solano Counties, California.* Prepared for State of California Department of Transportation, District 4, Oakland, California. Report on file at NWIC, Sonoma State University (S-17776).

Gilreath, Amy

1991 *Overview and Archaeological Reconnaissance of C&H's Proposed Co-generation Plant and Attendant Facilities.* Submitted to McClenahan and Hopkins Associates, San Mateo California. Report on file at NWIC, Sonoma State University (S-12396).

Haney, Jefferson

1990 *A Class III Cultural Resources Study of the Proposed Deepwater Outfall Pipeline Corridor through the Rhone-Poulenc Chemical Plant, Bulls Head Point, Contra Costa County, California.* Report on file at NWIC, Sonoma State University (S-11778).

Heizer, Robert F.

1954 The Archeology of Central California I: The Early Horizon. *University of California Anthropology Records*, Volume 12, No.1:1-84. Berkeley.

Hendry, G.W. and J.N. Bowman

1940 *The Spanish and Mexican adobe and other buildings in the nine San Francisco Bay Counties, 1776 to About 1850.* Ms. on file at the Bancroft Library, University of California at Berkeley.

Holman and Associates

1992 *Archaeological Culture Resource Study for the Bay/Shellmound Street Project.* Prepared for the City of Emeryville, City of Oakland, Caltrans. Prepared by Richard D. Ambro, Ph.D.

Holson, John and Lori Hager

1987 *A Cultural Resources Study for the Vaca Dixon-Moraga 230Kv Transmission Line Reconditioning Project, Contra Costa, Napa, and Solano Counties. Final Report.* Prepared for the Pacific Gas and Electric Co., Land Department, San Francisco, CA. Report on file at NWIC, Sonoma State University (S-9124).

Hulaniski, F.J.

1917 *The History of Contra Costa County, California.* Berkeley: The Elms Publishing Company.

Hunt, Marguerite

1926 *The History of Solano County, Volume 1.* Chicago: S.J. Clarke Publishing Company.

Jones, Terry

1980 *An Archaeological Survey of the Proposed P.G.&E. Transmission Line from the Lakeville Substation, Sonoma County to Sobrante Substation, Contra Costa County, California.* Prepared at the request of the Pacific Gas and Electric Company, San Francisco, California. Report on file at NWIC, Sonoma State University (S-2181).

Kroeber, Alfred

1970 *Handbook of the Indians of California.* Third Edition. California Book Company, Berkeley.

Kyle, Douglas E.

1990 *Historic Spots in California.* Stanford: Stanford University Press.

Levy, Richard

1978 Costanoan. In *Handbook of North American Indians*, Volume 8, California, Robert F. Heizer, Ed., pp. 485-495. Smithsonian Institution, Washington.

Purcell, Mae Fisher

1940 *The History of Contra Costa County.* Berkeley: The Gillick Press.

San Francisco Chronicle

28 February 1888; 27 August 1889

San Francisco Daily Herald

22 June 1850

San Francisco Evening Bulletin

2 July, 6 September 1864; 13 October 1865

San Francisco Examiner

25 August 1925

Self, William and Carry D. Wills

1994 *Architectural Data Recovery: J.L. Heald Agricultural Works ("Banker's Warehouse"); C&H Sugar Refinery, Crockett, Contra Costa County, California.* William Self Associates for Crockett Cogeneration, Portland Oregon. Report on file at NWIC, Sonoma State University (S-16152)

1996 *Archaeological Data Recovery, Monitoring and Mitigation for the Crockett Cogeneration Project, Crockett, Contra Costa County, California.* William Self Associates for Crockett Cogeneration, Portland, Oregon. Report on file at NWIC, Sonoma State University (S-17794).

Shipley, William

1978 Native Languages of California. In *Handbook of North American Indians*, Volume 8, California, Robert F. Heizer, Ed., pp. 80-90. Smithsonian Institution, Washington.

Shoup, L.H. and R.T. Milliken with Alan K. Brown

1994 *Inigo of Rancho Posolmi: The Life and Times of a Mission Indian and His Land.* Draft Report prepared for Woodward Clyde Consultants, November 1994. On file at Woodward Clyde, 500 12th Street, Oakland, Ca.

Lucy, Tom

nd *A History of the City of Vallejo.* Manuscript on file at the Vallejo Naval and Historical Museum, Vallejo California.

Margolin, Malcolm

1978 *The Ohlone Way: Indian Life in the San Francisco-Monterey Bay Area.* Berkeley: Heyday Books.

Marshall, Don B.

1978 *California Shipwrecks: Footsteps in the Sea.* Seattle: Superior Publishing Co.

Mason, John L.

1946 *Map of South Half of Naval Anchorage No. 26, Suisun Bay.* On file at the U.S. Department of Transportation, Maritime Administration, Suisun Bay Reserve Fleet.

Milliken, R.T.

1983 The Spatial Organization of Human Population on Central California's San Francisco Peninsula at the Spanish Arrival. M.A. thesis on file at Sonoma State University, Rohnert Park, CA.

Moratto, M. J.

1984 *California Archaeology.* Academic Press, Orlando.

NOAA

1999 *Automated Wreck and Obstruction Information System* (AWOIS). Maintained by the Operations Branch, Hydrographic Surveys Division of the National Oceanographic and Atmospheric Administration

Patterson, Scott M. and Jennie L. Goodrich

1980 *An Ethnographic Survey of the Native American Cultural Resources Along Pacific Gas and Electric Company's Proposed Lakeville-Sobrante 230Kv Transmission Line, in Sonoma, Marin, Napa, Solano, and Contra Costa Counties, California.* Report on file at NWIC, Sonoma State University (S-2363).

Perry, Charlene

1986 "Martinez: A Commercial and Industrial Center" in *Martinez: A California Town.* Martinez: RSI Publications.

Slocum, W.A.

1882 *The History of Contra Costa County, California.* J.P. Munro-Fraser, Historian. San Francisco: W.A. Slocum and Co.

Stachle, Melba Margaret

1945 *Educational Resources of a Certain California Community.* MA thesis, Stanford University. On file at the Vallejo Naval and Historical Museum, Vallejo, CA.

Tatam, Robert Daras

1993 *Old Times in Contra Costa. A Journey to the Past.* Pittsburg: Highland Publishers.

Wood, Ally and Company

1879 *History of Solano County.* J.P. Munro-Fraser, Historian. S.F.: Wood, Alley and Co.